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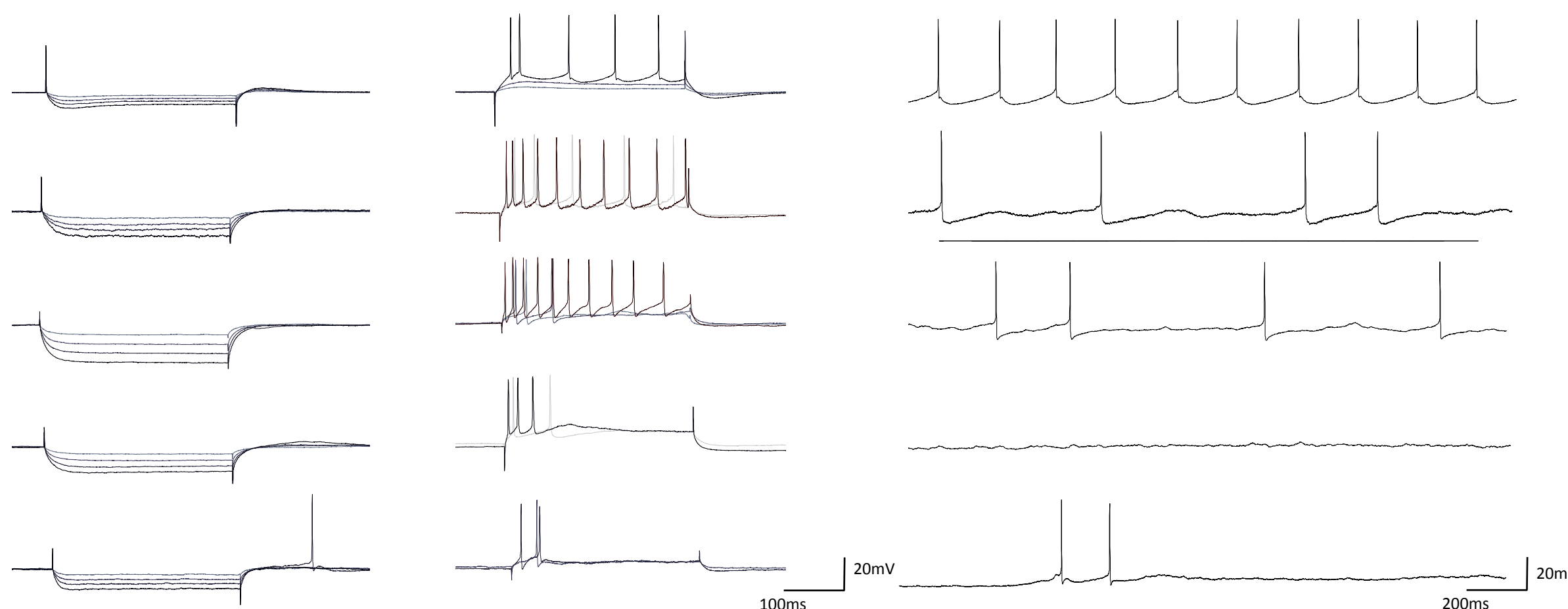
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## Introduction

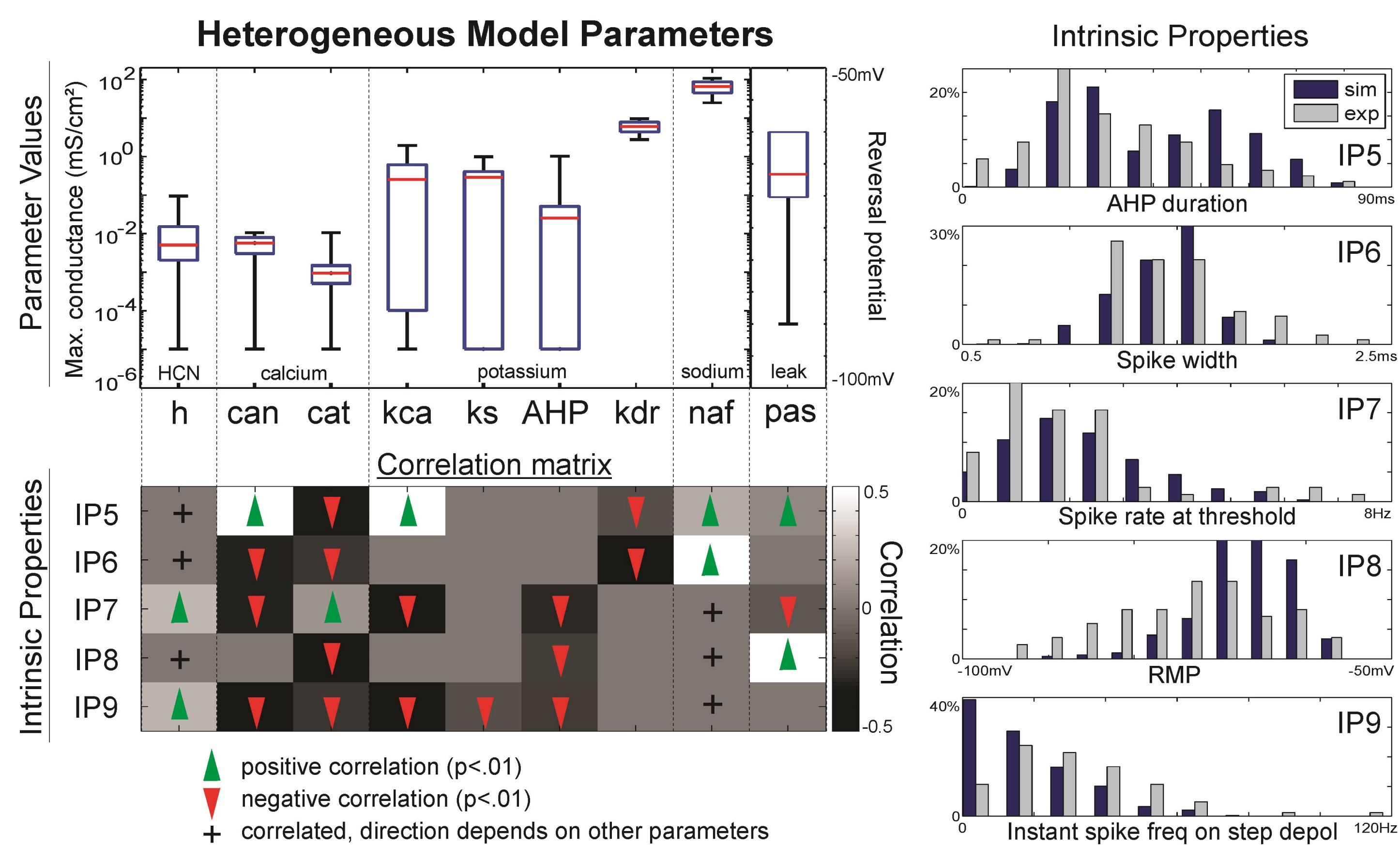
- Anterior cingulate cortex (ACC) receives inputs from many areas and is involved in a wide range of functions including decision making, motor control, and emotion.
- Fast network oscillations in the beta (15-30 Hz) and gamma (30-80 Hz) frequency range underlie many of the cognitive tasks associated with the ACC.
- We hypothesized that the unique complexity of ACC function might be reflected in a diversity of cellular and network properties in this region.

## CELL PROPERTIES

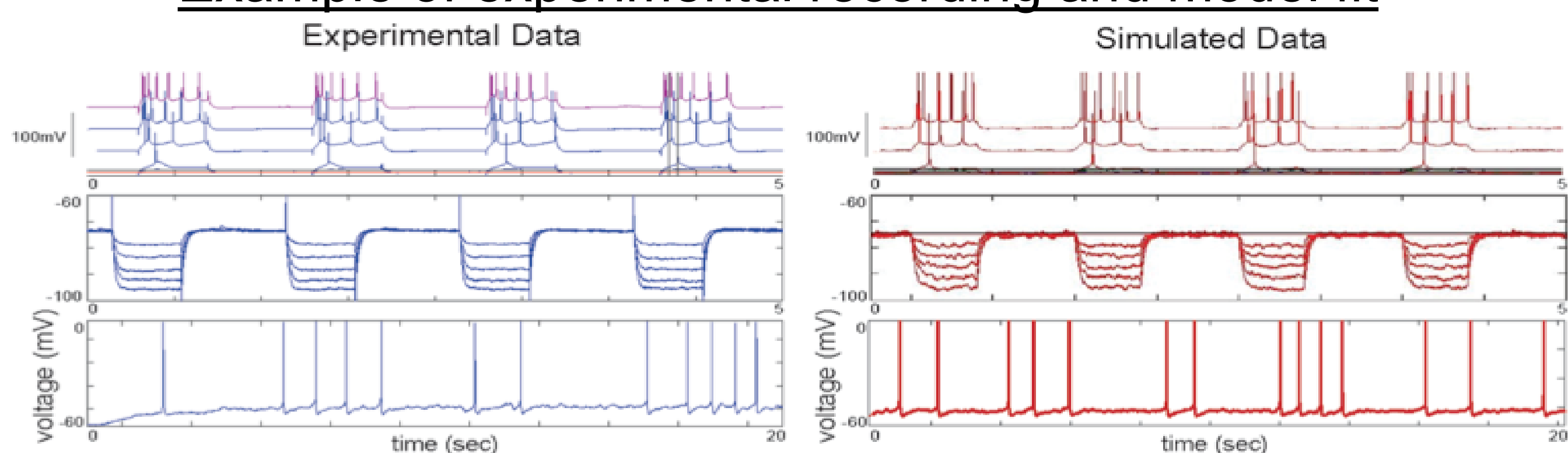
Cells exhibit diverse intrinsic properties (IPs) in rat ACC



**Biophysical diversity reproduces IP diversity in Hodgkin-Huxley type cell models**



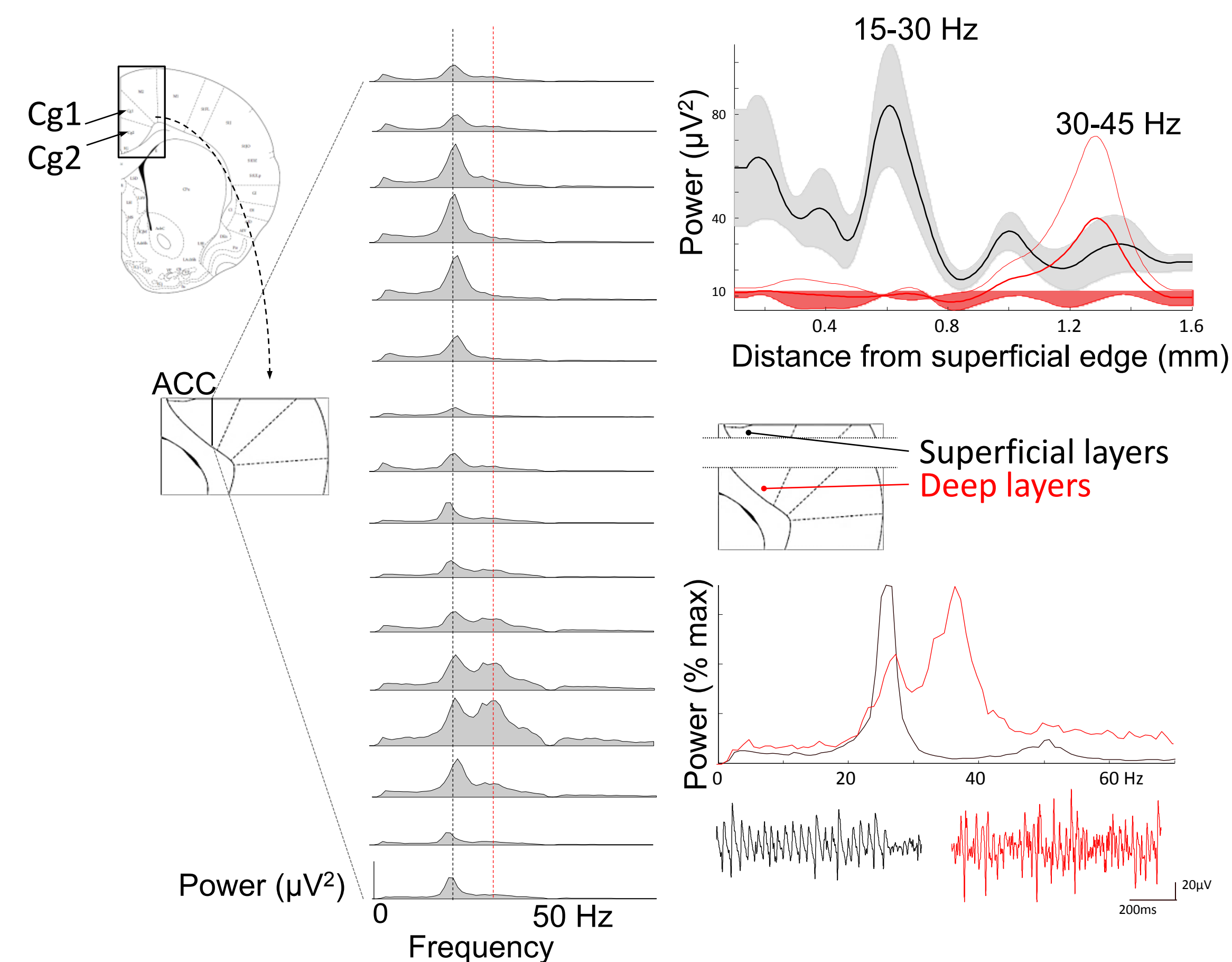
**Example of experimental recording and model fit**



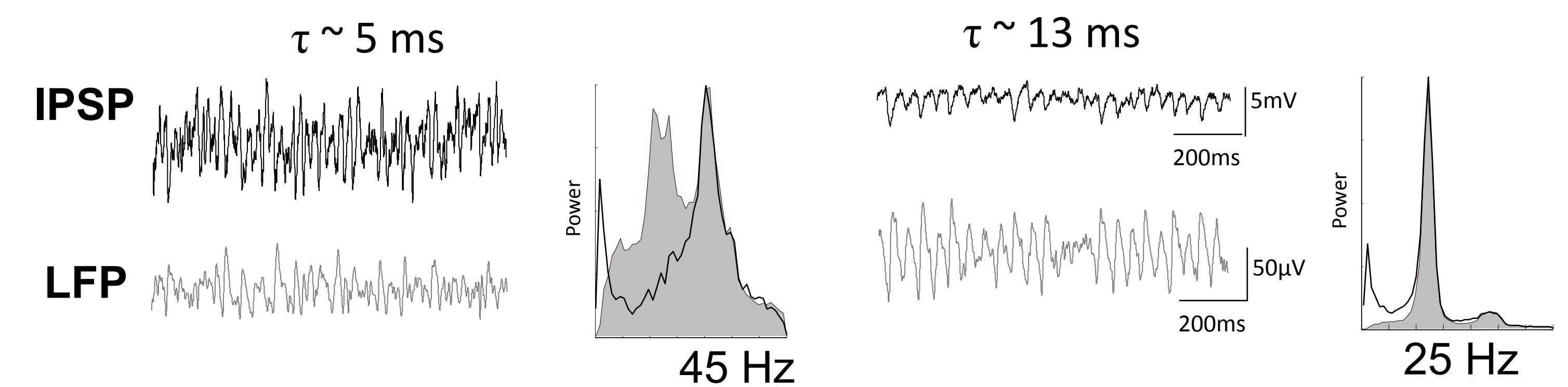
Cell diversity may support a range of computational properties in ACC.

## NETWORK DYNAMICS

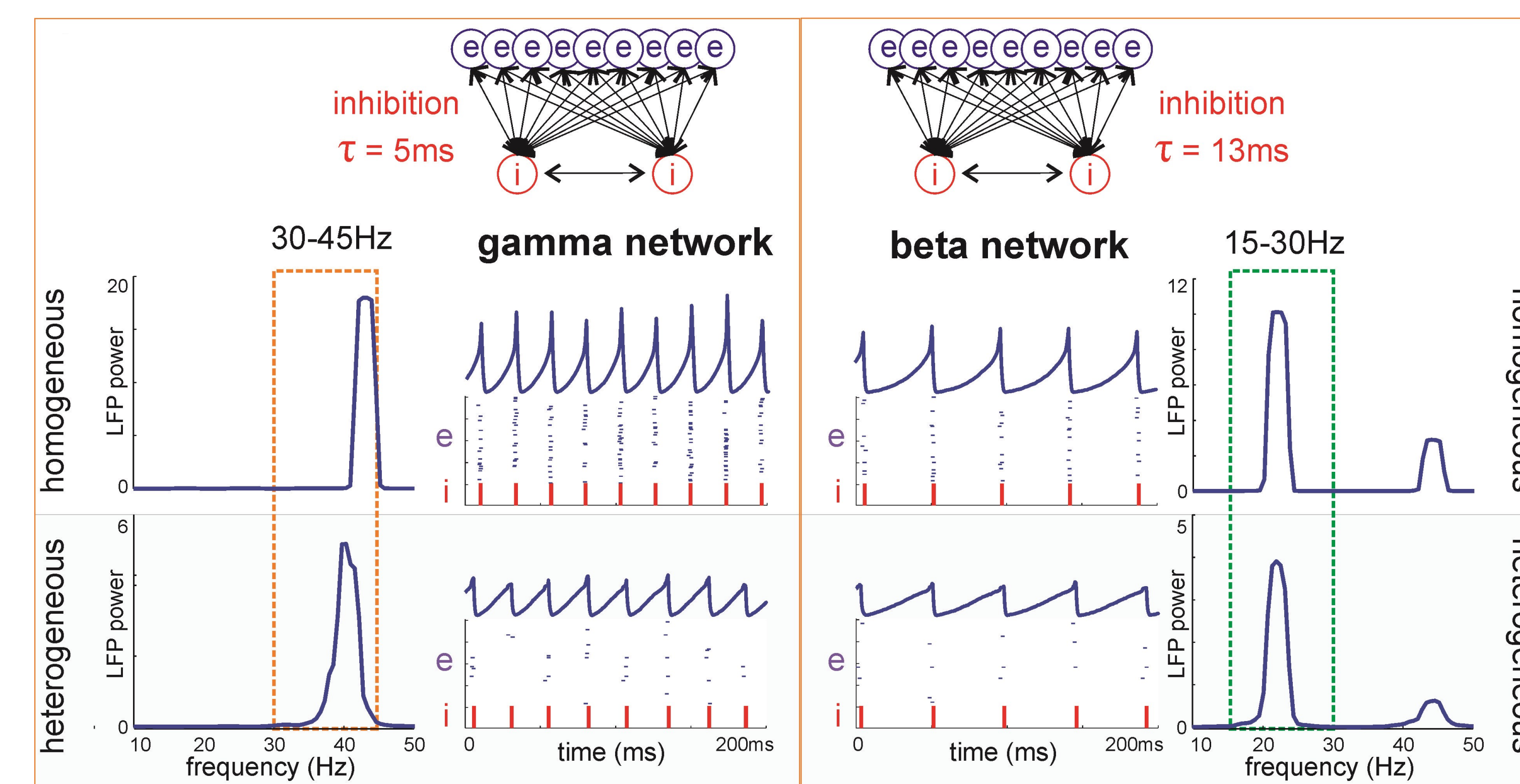
**ACC networks exhibit robust beta and gamma rhythms *in vitro***



**IPSPs of cells rhythmic with beta and gamma have different time constants**



**Robust rhythms are reproduced in network model with different inhibition decay time constants**

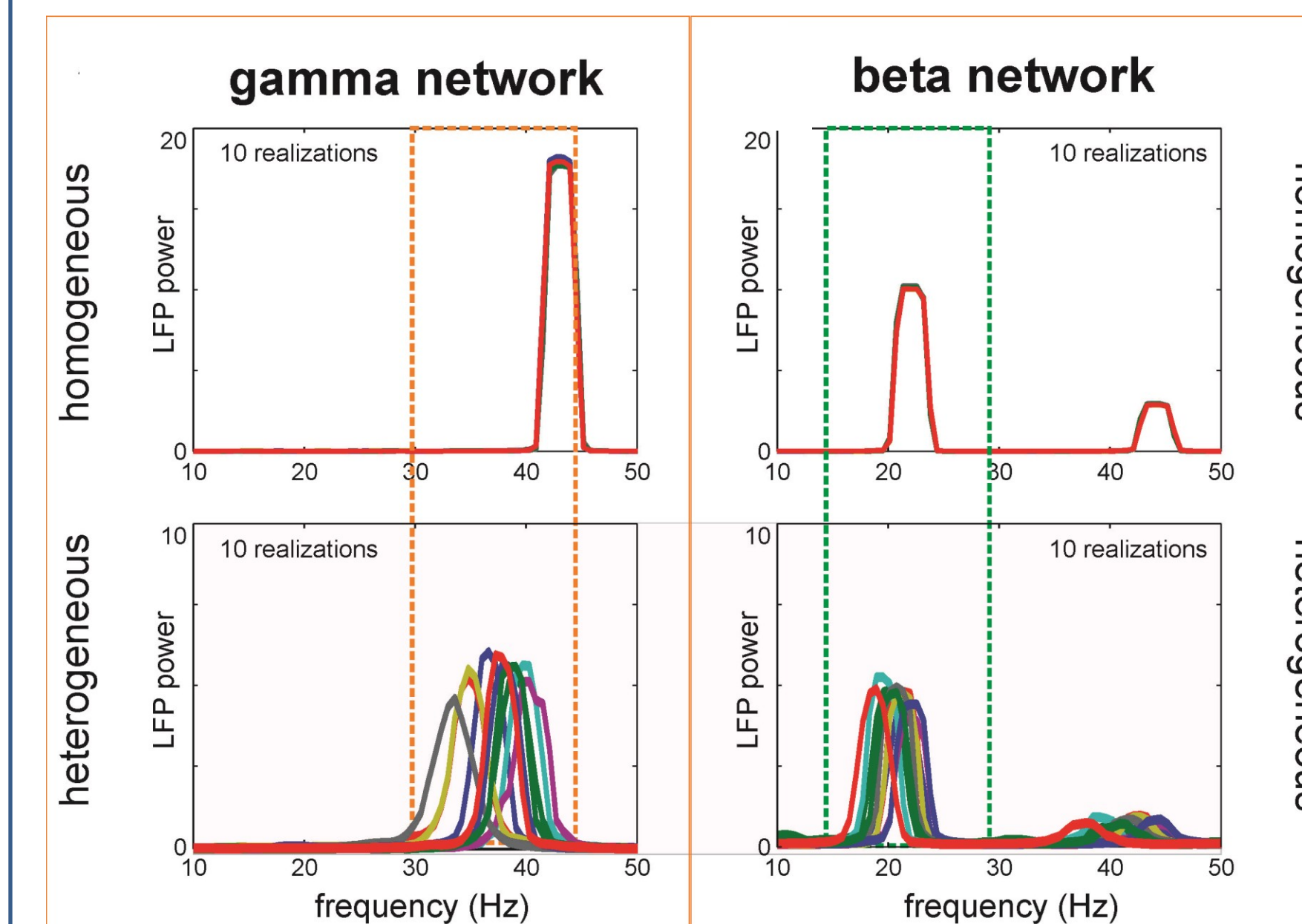
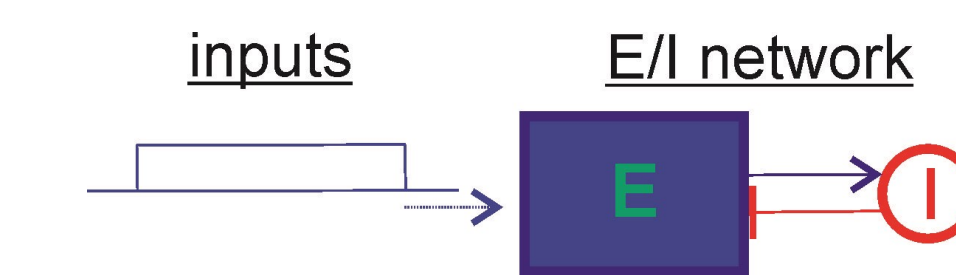


Network oscillations may support robust communication between ACC and other areas despite cell diversity.

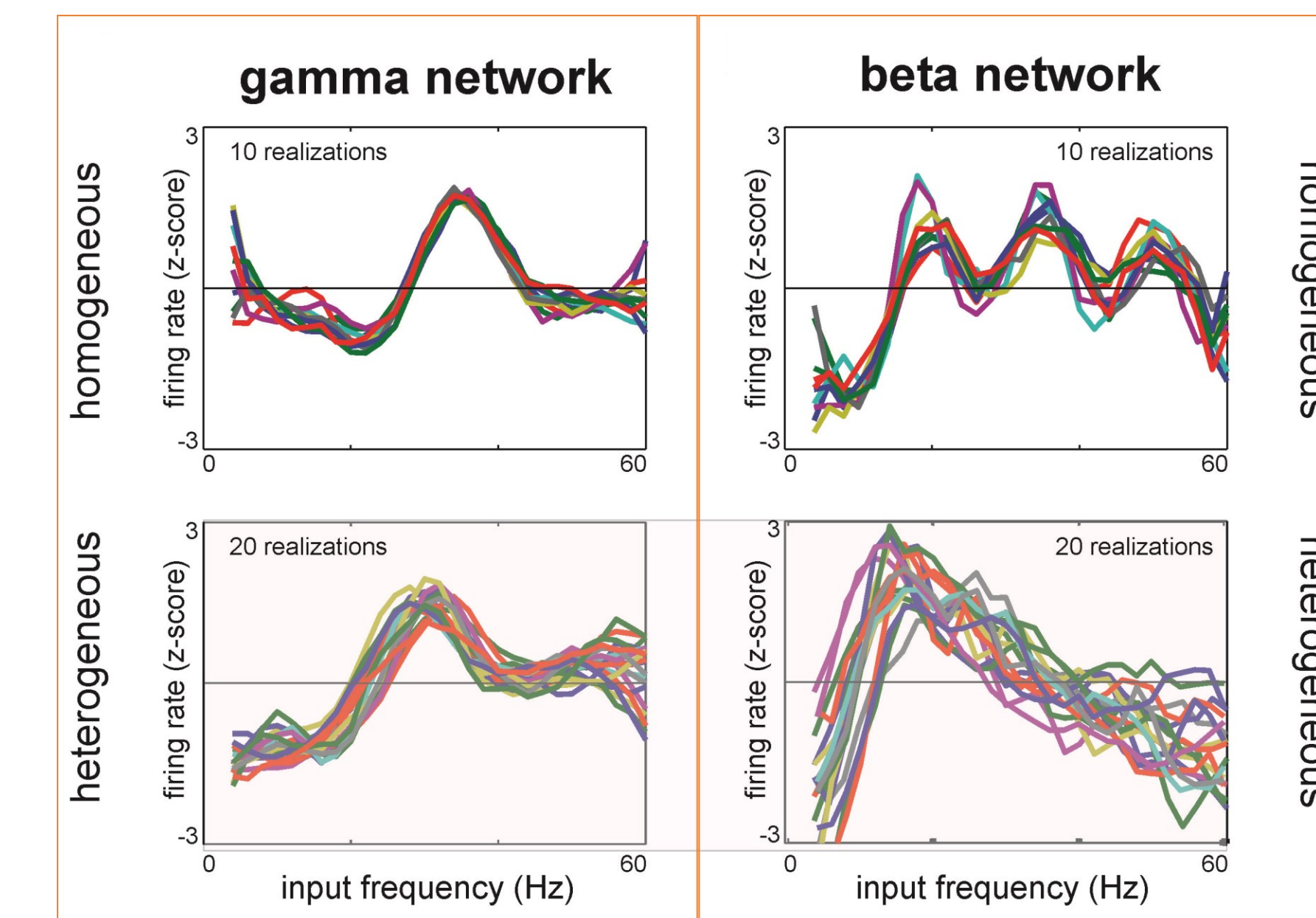
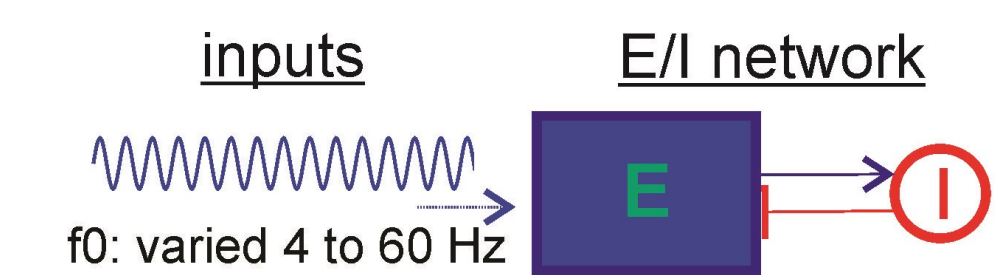
## EFFECTS OF DIVERSITY

**Diversity broadens intrinsic oscillations and tuning**

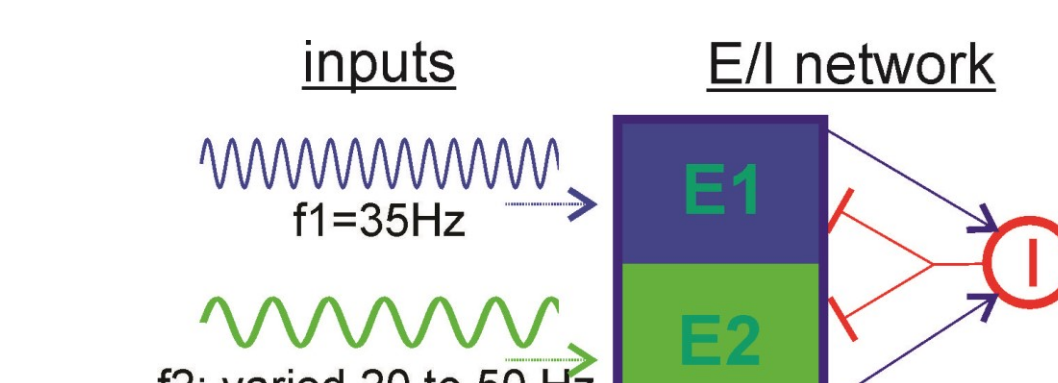
**Intrinsic frequencies of network**



**Resonant frequencies of network**

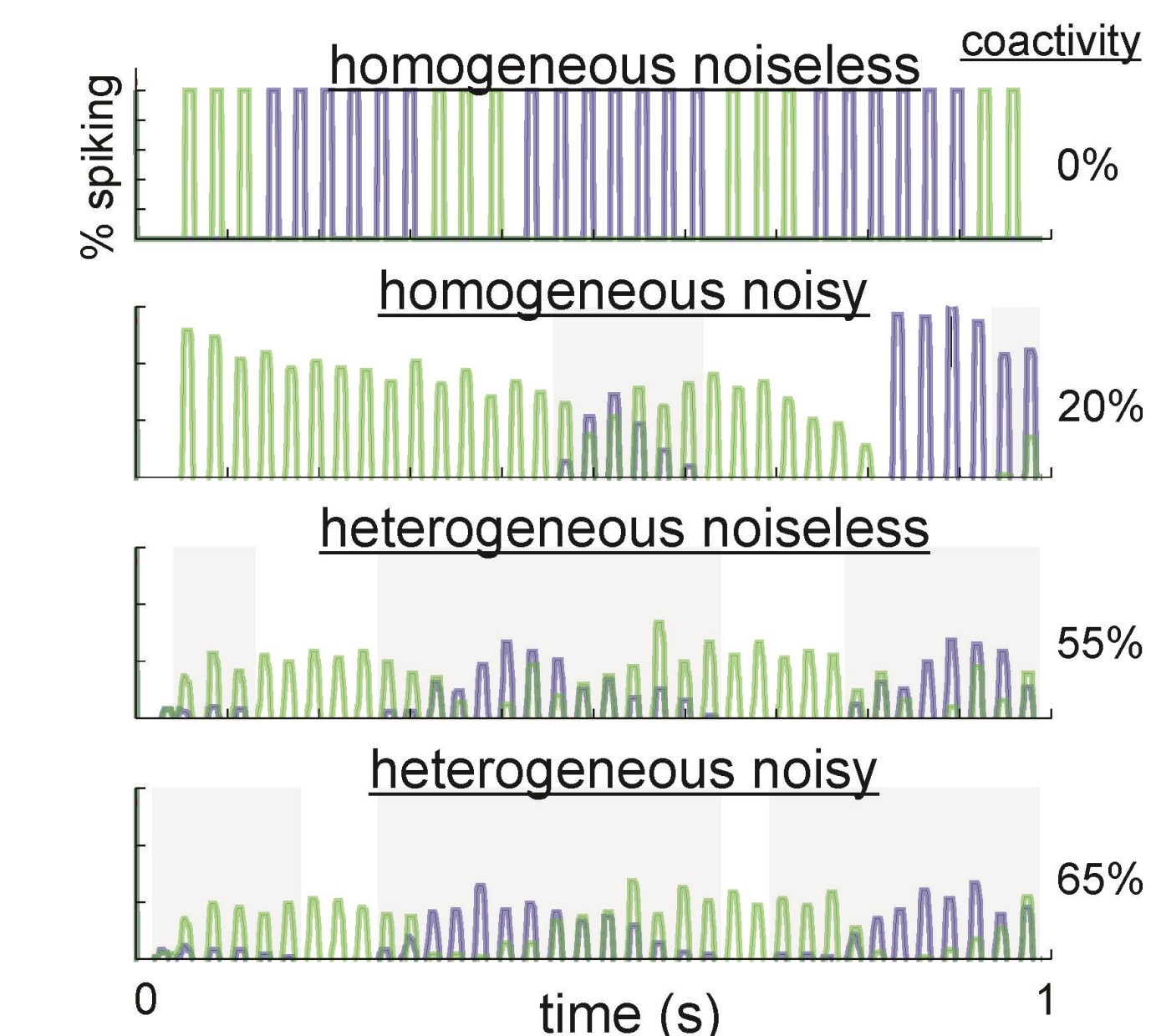


**Diversity supports routing multiple inputs simultaneously**

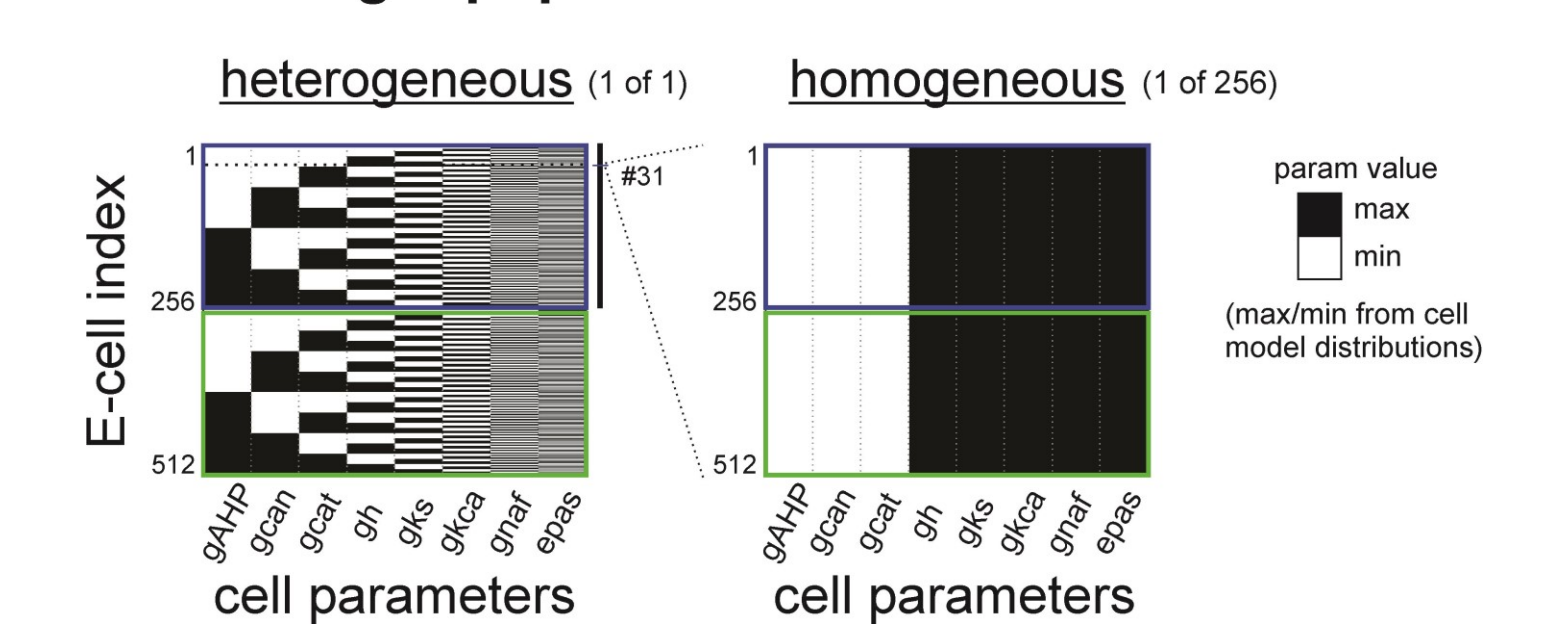


**Example network responses**

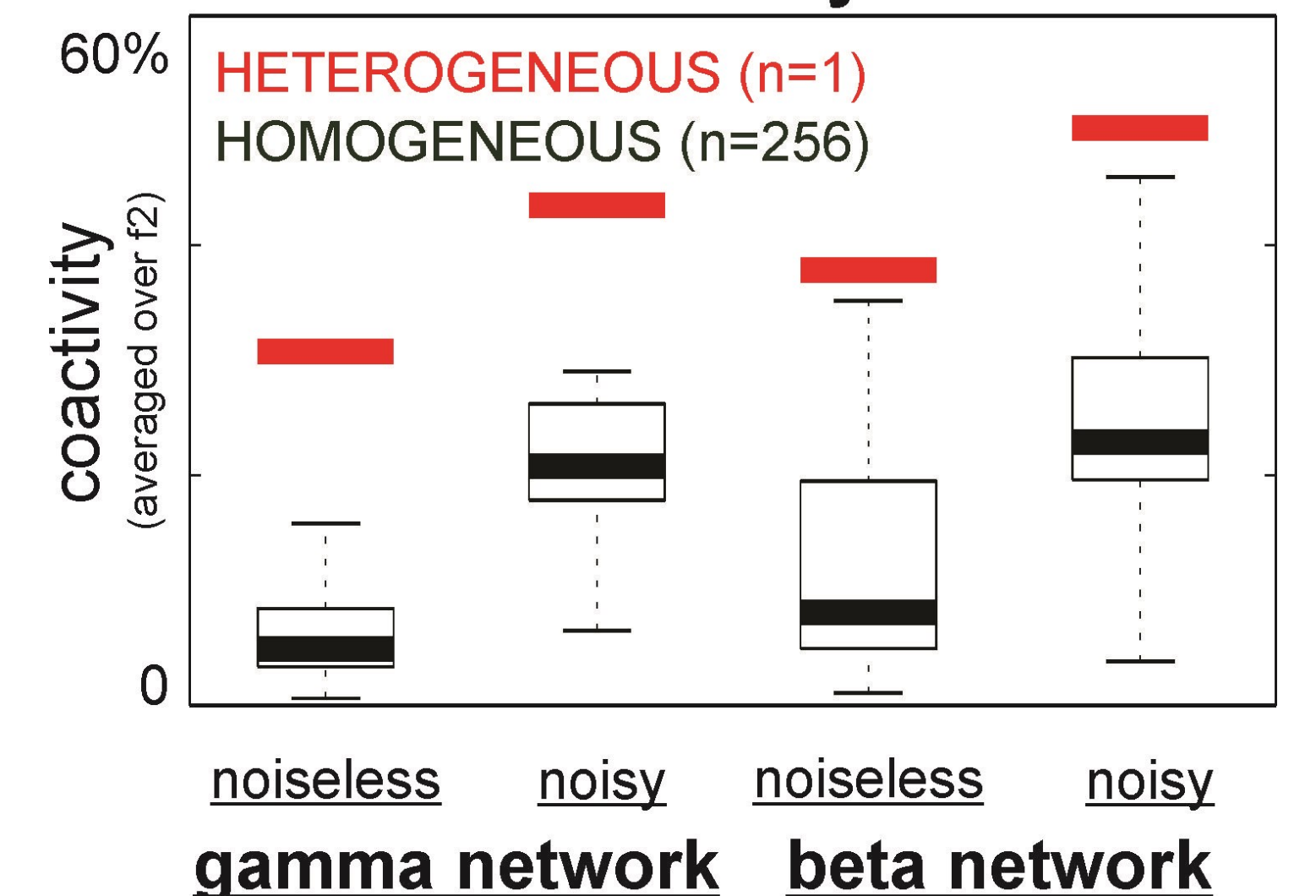
(Inputs: f1=35Hz, f2=37Hz) E1 E2



**Defining E populations for 257 networks**



**E1/E2 Coactivity**



- Cell diversity and noise increase network coactivity; diversity has a larger effect.
- Increased coactivity supports routing multiple inputs simultaneously, enabling parallel processing and downstream integration.

**Acknowledgments**

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